



Subpixels analysis model applied to floodplain monitoring

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The traditional techniques to gauge hydrological events often fail with the extreme events. A particular case is the floods spatial detection. In this work, the remote sensing techniques and Geographic Information Systems (GIS) have been merged to develop a key tool for monitoring of floods. The low density of gauge stations networks in the development countries becomes remote sensing techniques the most suitable and economic way to delimitate the flood area and compute the damages cost.

The common classification techniques of satellite images use “hard methods” in the sense of a pixel is assigned to an unique land cover class. For coarse resolution, the pixels inevitably will be mixed, so “soft methods” can be used in order to assign several land cover classes according to the surface fractions covered by each one. The main objective of this work is the dynamic monitoring of floods in large areas, based on satellite images -with moderate spatial resolution but with high time resolution- and Digital Elevation Model (DEM). Classified maps with finer spatial resolution can be built through the methodology of Subpixels Analysis developed.

The procedure is supported on both the Linear Mixture Model (LMM) and Spatial Coherence Analysis (SCA) hypothesis. The LMM builds the land cover fraction maps through an optimization procedure which uses Lagrange Multipliers, while the SCA defines the most likely place for the land cover fractions within the coarse pixel using linear programming. A subsequent procedure improves the flooded area identification using both the drainage direction and flow accumulation raster maps derived from DEM of the study zone.

The Subpixels Analysis technique was validated using historical data of floods which were obtained from satellite images. The procedure improves the spatial resolution of classified maps from satellite images with coarse resolution, while the “hard methods” keep the spatial resolution from the input coarse satellite image.